

Claims

- [c1] 1.A medical device positioning system for use during a medical procedure on a subject performed during imaging, the system comprising:
a medical device adapted for internal use within the subject for performing the medical procedure;
an imaging device for acquiring image data of a region of interest within the subject; and,
a medical device monitoring subsystem for monitoring position of the medical device relative to a target region of interest within the subject and for providing feedback to an interface unit when the position of the medical device deviates from the target region of interest.
- [c2] 2.The system of claim 1 wherein the medical monitoring subsystem is adapted to receive configuration information corresponding to the medical device and wherein the configuration information comprises at least one of three-dimensional (3D) coordinates of the device, tracking method information corresponding to the medical device, physical dimensions of the device and a model representation of the device.
- [c3] 3.The system of claim 1 wherein the medical device monitoring subsystem is responsive to at least one of movement of the subject and movement of the medical device relative to the target region of interest within the subject.
- [c4] 4.The system of claim 3 wherein the medical device monitoring subsystem responds to the movement with a predetermined response if the medical device position deviates by a specified distance from the target region of interest and wherein the predetermined response comprises at least one of terminating therapy, activating the imaging device to acquire a new image and activating an advisory message to the interface unit.
- [c5] 5.The system of claim 1 wherein the medical device monitoring subsystem is further adapted for providing advisory feedback to the interface unit.
- [c6] 6.The system of claim 5 wherein the advisory feedback comprises at least one of a visual icon representing position of the device, a text message and an

advisory.

- [c7] 7.The system of claim 1 further comprising a tracking device for tracking a location of the medical device.
- [c8] 8.The system of claim 1 wherein the imaging device comprises at least one of a magnetic resonance imaging (MRI) scanner, a computed tomography (CT) scanner, a X-ray device, a Positron Emission Tomography (PET) system and an ultrasound scanner.
- [c9] 9.The system of claim 1 wherein the medical device comprises at least one of a biopsy needle guide, an invasive probe, an ablation device, a laparoscope and a therapeutic laser.
- [c10] 10.The system of claim 1 wherein the interface is further adapted to respond to operator input of coordinates marking a desired target position for the medical device.
- [c11] 11.The system of claim 2 wherein the medical device configuration information comprises information corresponding to a plurality of medical device types and includes a visual representation of the medical device for superimposing on the images based on the device configuration information for a selected medical device.
- [c12] 12.The system of claim 11 wherein the visual representation of the medical device is a wire-frame model of the medical device.
- [c13] 13. A medical device positioning system for use during a medical procedure on a subject performed during imaging, the system comprising:
a medical device adapted for internal use within the subject for performing a medical procedure;
an imaging device for acquiring image data of a region of interest within the subject;
a tracking device for tracking a location of the medical device; and,
a processor coupled to the medical imaging device and the tracking device for generating images of the region of interest with a visual representation of the

medical device superimposed on the images and the processor is further adapted to monitor a position of the medical device relative to the region of interest, the processor responding to change in the position and providing feedback to an interface.

- [c14] 14.The system of claim 13 wherein the medical imaging device comprises at least one of a magnetic resonance imaging (MRI) scanner, a computed tomography (CT) scanner, a X-ray device, a Positron Emission Tomography (PET) system and an ultrasound scanner.
- [c15] 15.The system of claim 13 wherein the medical device comprises at least one of a biopsy needle guide, an invasive probe, an ablation device, a laparoscope and a therapeutic laser.
- [c16] 16.The system of claim 13 wherein the interface is coupled to the processor for displaying the images representing the region of interest and the visual representation of the medical device, the interface being for use in positioning the medical device during the medical procedure and being further adapted to respond to movement of the medical device in real-time.
- [c17] 17.The system of claim 13 wherein the feedback provided comprises at least one of a visual icon representing position of the device, a text message, and an audio advisory.
- [c18] 18.The system of claim 13 wherein the interface is further adapted to respond to operator input of coordinates marking a target position of the medical device.
- [c19] 19.The system of claim 13 wherein the processor is further adapted to provide an advisory response when the medical device deviates from a specified target position.
- [c20] 20.The system of claim 13 wherein the processor further includes medical device configuration information corresponding to a plurality of medical device types and wherein the visual representation of the medical device on the images is based on the device configuration information for a selected medical device.

- [c21] 21.The system of claim 20 wherein the visual representation of the medical device is a wire-frame model of the medical device.
- [c22] 22.The system of claim 13 wherein the processor is further adapted to respond with a predetermined response if the medical device position deviates by a specified distance from the target region of interest and wherein the predetermined response comprises at least one of terminating therapy, activating the imaging device to acquire a new image and activating an advisory message to the interface unit.
- [c23] 23.A method for positioning a medical device comprising:
generating at least one image of a region of interest of a subject including a representation of a medical device superimposed in the image;
monitoring a position of the medical device relative to a target region of interest within the subject; and,
providing feedback to an interface upon detection of a change in position of the medical device relative to the target region.
- [c24] 24.The method of claim 23 wherein the feedback comprises at least one of a first visual icon representing position of the device and a second visual icon representing the target region of interest, a text message, an audio advisory and predetermined response.
- [c25] 25.The method of claim 24 wherein the predetermined response comprises at least one of terminating therapy, activating the imaging device to acquire a new image and activating an advisory message to the interface unit.
- [c26] 26.The method of claim 23 wherein the interface is adapted to respond to operator input of coordinates marking a target position of the medical device.
- [c27] 27.The method of claim 23 wherein image data is acquired using of at least one of a magnetic resonance imaging (MRI) scanner, a computed tomography (CT) scanner, a X-ray device, a Positron Emission Tomography (PET) system and an ultrasound scanner.
- [c28] 28.The method of claim 23 wherein the feedback is used for navigating the

medical device to a target region of interest.

[c29] 29.The system of claim 1 wherein the feedback is used for navigating the medical device during the medical procedure.

[c30] 30.The system of claim 13 wherein the feedback is used for navigating the medical device during the medical procedure.